

# PHYSICAL PREPARATION FOR GOLF

– Written by Daniel Coughlan, Nigel Tilley, UK, Luke Mackey, Australia, Fiona Scott, Simon Brearley, and Chris Bishop, UK

## INTRODUCTION

Historically, in both the recreational and professional game, golf is not a sport that has a strong tradition of physical preparation. At the recreational level, less than 30% of golfers do any structured warm up and most golf facilities do not have a gym. However, a greater understanding of the health- and performance-related benefits of fitness training is changing this, with elite and professional players now viewing physical preparation as being as important as golf practice. Specifically, it is now common to see athletic warm-ups and physical training regimes focusing on dedicated speed training on the range, improving strength, power, and range of motion in the gym, and drawing on the planning expertise of strength and conditioning coaches to ensure this training is optimised through effective modulation of stress, adaptation, and recovery. As a result, professional players are exhibiting faster clubhead speeds than ever before, which naturally translates to hitting the ball a greater distance.

This “new” focus on physical preparation has been heavily fuelled by the success of Tiger Woods and others, in addition to increased data use. For example, the creation of Strokes Gained by Broadie uses an algorithm from years of data on the PGA Tour to highlight that players who drive the ball further can gain strokes on other

players, through an increased likelihood to hole out in fewer shots<sup>1</sup>. This has resulted in players paying more attention to metrics such as clubhead speed, ball speed and carry distance<sup>2</sup>, which are heavily influenced by physical preparation work in the gym. Figure 1 highlights the core components of physical preparation, but excludes other important factors like nutrition, hydration and sleep.

In addition to direct improvements in performance, physical preparation is likely to have a number of health-related benefits for recreational and elite golfers. Previous literature outlines the importance of physical training for golfers on physical health<sup>3,4</sup>, positive impact on mental health<sup>4</sup>, and the enhanced ability to withstand fatigue and recover between sessions<sup>5</sup>. However, competing at the highest level in this sport provides some challenges such as travel fatigue and jet-lag, the persistent living in hotels, the impact this has on over-arching sleep quality and quantity, and repetitive stress placed on specific parts of the body from the sport itself, to name a few.

## SPECIFIC CONSIDERATIONS FOR THE ELITE AND PROFESSIONAL GOLFER

While physical preparation can help a golfer tolerate the lifestyle demands of their job, coaches require an understanding of common barriers and constraints associated

with a player’s lifestyle and optimal ways of working around them, in order for the effects to be maximised.

### *Season structure*

The average professional will compete between 18 to 30 weeks per year. The major professional golf tours run year-round, with players travelling around the globe. While there are gaps from competition through the year, there is no traditional ‘off-season’ (a key consideration when organising training and recovery across the year). Depending on the player’s category within a tour, they may have varying degrees of choice over which events they play, with higher ranked players having increased opportunity to design their season structure. Once at an event, the weeks are long and taxing. Players commonly compete Thursday to Sunday (although approximately half are ‘cut’ and do not play the weekend), Pro-Am events are scheduled on Wednesdays, with Tuesdays set aside for practice and Mondays typically for travel.

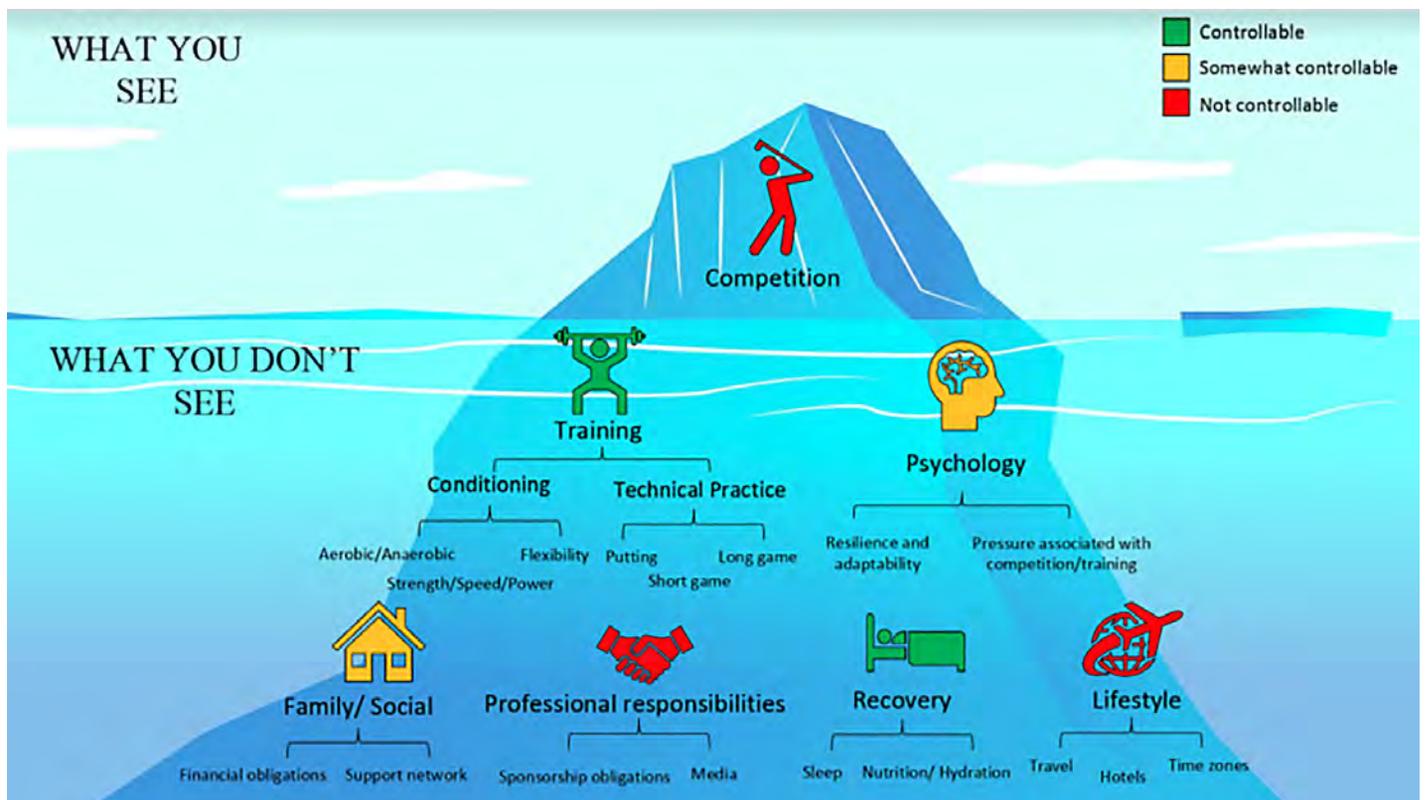
### *Personal schedules and commitments*

Players are looking to make continued physical and technical improvements across the whole year, so practice, training and competition frequently merge, while they actively pursue longer term progress. Players may also have various required



**Figure 1:** Core components of physical preparation to maximise performance.

**Figure 2:** Illustration showing some key stressors for a professional golfer and degree of control they have over them during competition (from BJSM Blogs by West et al<sup>6</sup>).



media and wider commitments. Days during competitive play are long, with rounds often taking 4-5.5 hours, warm-ups often taking 60-90 minutes before the round, and further practice after the round also often completed (especially if they have played poorly). Players must also be adaptable, often having less than 24 hours' notice of competition start times (which can vary from 7am to 3pm), working around rain delays, being on event reserve lists, etc. In addition, being away from home so often, players may also take their families to events, which can be helpful for their wellbeing, but further increases pressure on their time and their sleep hygiene.

*Travel, recovery and rest*

Professional golfers travel significant distances most weeks and frequently need to manage travel-fatigue and jet-lag symptoms. The quality of training and recovery facilities at events and tournament hotels will also vary substantially and players will need to be able to adapt to this on a weekly basis, highlighting the importance for players to have a strong understanding of a wide variety of approaches that can be utilised for the purpose of warm-up, recovery and maximising physical condition. Figure 2 highlights some of what goes unseen from the casual observer and

TABLE 1

	<b>Constraint</b>	<b>Example Solutions</b>
Season/tournament structure	No off-season	Prioritise key areas for development and work towards improvement through competitive blocks, rather than maintenance.
	Limited control of schedule	Ensure effective player-coach communication to adapt to schedule/commitment changes and/or exploit schedule breaks.
	Need to make progress in tournament weeks	Focus on maintaining training intensity throughout the week, but reduce volume close to/during tournaments. Use of online programming software can help build accountability and maintain a regular feedback loop. Maximise training opportunities resulting from missed cuts.
Personal schedules and commitments	General time pressures on physical preparation work	Keep sessions short and efficient. Ensure the player knows how/where to cut them even shorter if needed. To do this efficiently, ensure a high degree of outcome clarity so programming can be optimised. The player should know how to effectively use their downtime to optimise recovery, and how to adapt their practice and preparation when time is constrained.
	Variable start times on short notice or significant changes to the plan (media, practice commitments, rain delays)	Build confidence with training before or after competitive rounds, and on any day of the week so sessions can be moved rather than missed. Ensure the player can adapt warm-up routines to meet the demands of the day.
Travel, recovery and rest	Variable gym equipment	Ensure the player can independently adapt any exercise to elicit target adaptations using different equipment (and/or provide a programme A, B, C for varying equipment options). Encourage pre-planning and identify facilities available before the event.
	Variable recovery facilities	Support players to identify a range of recovery options that work for them, and how/when to apply them.
	Jet-lag and fatigue	Where possible utilise an appropriate volume/intensity of exercise to support jet-lag and fatigue management. But also recognise when a rest day is required, and a session should be missed. The player should understand how to modify all aspects of their practice and training when fatigued. Ensure players are educated on factors affecting sleep and jet-lag to effectively design and carry out a plan. Encourage use of jet-lag planning apps.

*Note: In addition to these proposed solutions, it is crucial a shared understanding of the physical preparation plan is established by the team, ensuring all parties know how and when progress will be evaluated.*

**Table 1:** Proposed solutions to common challenges for the elite/ professional golfer.

Table 1 offers some example solutions to the common challenges golfers may be faced with.

#### PHYSICAL PREPARATION PLANNING

##### *Warm-up and priming*

Warm-up is a neglected area for the recreational golfer. The literature generally agrees that less than 30% of golfers do any physical warm-up<sup>7</sup>, while slightly more than this practice golf shots prior to the first tee. Evidence generally points towards golfers who warm-up performing better, and having a decreased risk of injury<sup>8</sup>. At the professional level, most players now have a physical warm-up that includes an aerobic component (e.g., on a stationary bike), some flexibility and/or strength work, and then

work on the putting green and driving range. Some will do further priming work in the gym, but it is important to acknowledge that the evidence suggests that the most effective warm-ups will either be dynamic in nature or include some form of resistance training. In contrast, purely static stretching is noticeably inferior than other methods and, sometimes, even detrimental to golf performance<sup>7</sup>.

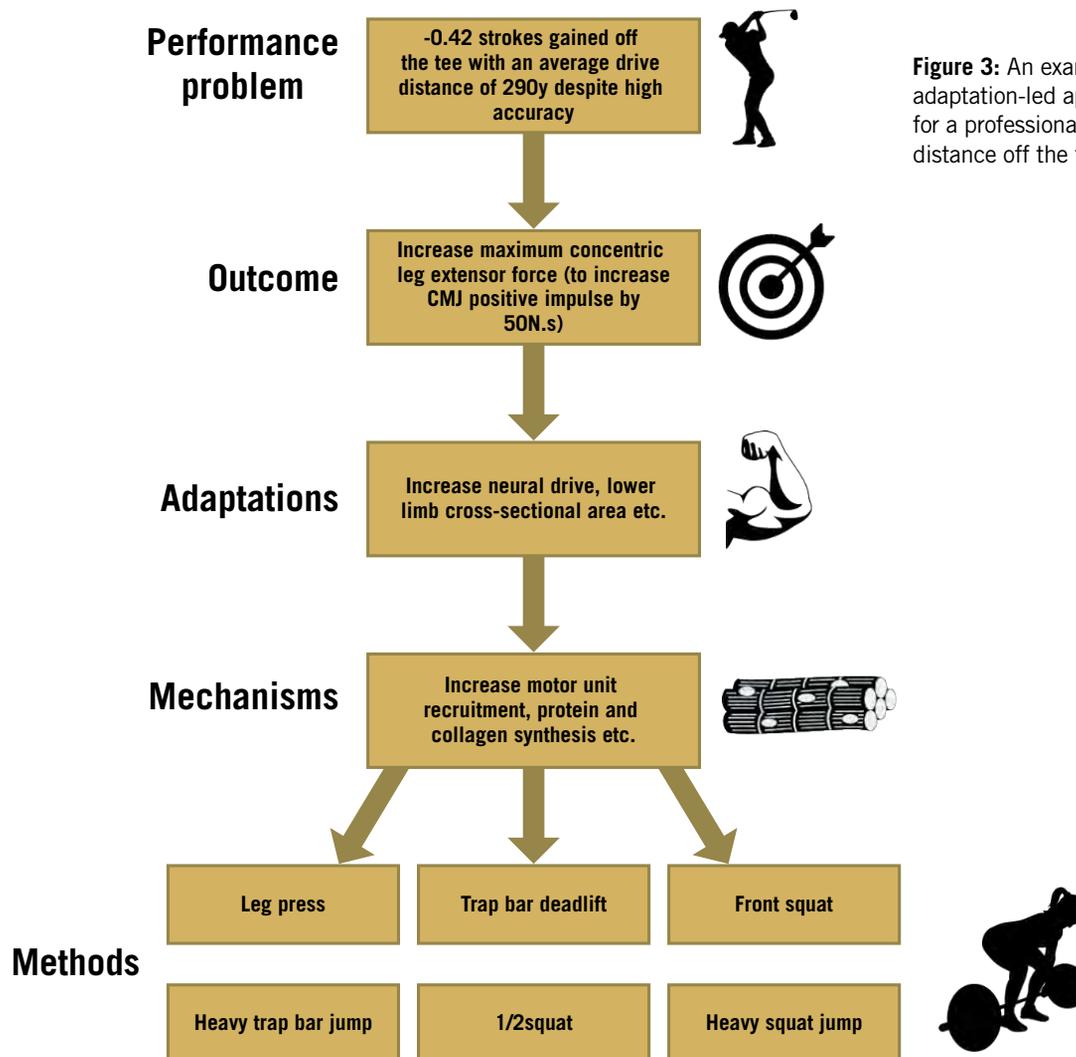
#### PHYSICAL TRAINING AND SPEED TRAINING: AN OUTCOME-FOCUSED APPROACH

When planning physical preparation, we advise an outcome-focused approach over a methods-focused one. Broadly speaking, we can break the outcome-focused approach into three key sub-categories: 1)

an adaptation-led approach to strength and conditioning, 2) a learning-based approach to speed training, and 3) a perceived wellbeing and readiness approach to recovery and stress/load management. Of note, warm-up and priming strategies often work across these three domains, sometimes acting as a strength and conditioning stimulus (category 1), at other times trying to hone a 'feel' ready for learning (category 2), or to impact perceived wellbeing and readiness to perform (category 3).

##### *An adaptation-led approach to strength and conditioning*

When planning strength training, an adaptation-led approach takes a performance problem (e.g., poor drive



**Figure 3:** An example outcome-focused, adaptation-led approach to exercise selection for a professional golfer struggling with distance off the tee.

distance relative to the field), an appropriate performance outcome required to indicate a meaningful change has occurred (e.g., improved countermovement jump [CMJ] score by the amount required to noticeably impact the players performance). Then we work back to understand the desired adaptations and physiological mechanisms which would underpin a change to the target outcome (e.g., increase neural drive and motor unit recruitment). From this point, a menu of appropriate interventions would be available, from which the coach and athlete would select, considering both constraints and preferences. This process is outlined in Figure 3 with a focus on exercise selection, but the same process should also be applied to other training variables (e.g., volume and intensity of training, repetition/set balance, rest periods etc.).

Building on the example in Figure 3, a full training programme is shown in

Table 2. This programme addresses the same performance problem, but expands the agreed outcomes to be more representative of the results of a full consultation with this example player. This is a fictitious worked example of an outcome-focused, adaptation-led programme, which considers real-world touring professional constraints. In this case, the player is in a busy competitive block (June-July), will be competing most weeks during this period, and are primarily a DP World Tour golfer, so there will be minimal travel outside of Europe (i.e., jet-lag and long haul travel disruption will not be a primary concern). The key outcomes for this player are listed below:

- Increase maximal concentric leg extensor force.
- Increase eccentric rotation rate of force development.
- Increase upper limb force @ 100 m/s.
- Increase lean body mass.

The programme has been written so that the player prioritises the exercises in order (e.g., if they were short on time, they might cut out the last exercise on that day rather than do less sets of every other exercise). As the programme develops through the week, the volume reduces, while exercise intensity remains unaffected. This allows the player to still achieve the same outcomes from their training, without accumulating as much fatigue. Volume is manipulated in a few ways in our example. As the week goes on, the number of exercises in the sessions reduce and total repetitions in the sessions reduce as well (118 in session 1, 61 in session 2, and 46 in session 3). Also, to minimise delayed onset muscle soreness and fatigue, exercises become more concentric-dominant as the week progresses. Session 3 is also appropriate to be used as a priming session 2-3 hours before a tee time

TABLE 2

Exercise	Prescription	Outcomes (primary outcome in bold)	Alternatives
<b>Session 1 (Monday)</b>			
A. Front squat	6 sets x 3 reps @ RPE 8+ 3 mins+ rest	<b>a, b, d</b>	Leg press, trap bar deadlift, deadlift, IMTP with towel, goblet jump squats
B. Push press	4 sets x 4 reps @ RPE 6-7 (~0.6 m/s) 3 mins+ rest	<b>c, d</b>	DB push press, bench press, DB bench press, ballistic bench, MB throws
C. GHD supine hold with rotation	4 sets x 5 reps each side, focus on 3-5 s eccentric @ RPE 7-8 1-2 mins rest	<b>b, d</b>	BB standing Russian twist, DB seated Russian twists, eccentric pallof press
D1. Pull-up	3-4 sets x 6-8 reps @ RPE 8+	<b>d, c</b>	Lat pull-down, lateral cable/band pull-down, row variations
D2. Staggered stance barbell hip thrust	3-4 sets x 6-8 reps each side @ RPE 8+ 2 mins rest	<b>d, a, b</b>	DB or banded hip thrusts, long lever hip thrusts, staggered stance RDL's, banded RDL's
<b>Session 2 (Wednesday)</b>			
A. Trap bar jump	4 sets x 3-4 reps (~0.6 m/s) 3 mins+ rest	<b>a, b, d</b>	Squat jump, Olympic lifting variations (e.g., hang clean), goblet squat jump, heavy leg work (e.g., leg press)
B. Bench throw	3 sets x 3-4 reps (~0.7 m/s) 2-3 mins rest	<b>c, d</b>	MB throws, ballistic bench, push press variations
C. Barbell rollout	3 sets x 6 reps @ RPE 8+ 1-2 mins rest	<b>b, d</b>	Weighted alekna's, plank, leg lowers
D. BB rear foot elevated split squat	3 sets x 5 reps each side @ RPE 7-8 1-2 mins rest	<b>d, a, b</b>	DB rear foot elevated split squat, leg press (bilateral or unilateral), pistol squats
<b>Session 3 (Friday/Saturday)</b>			
A. ½ squat off the pins	3 sets x 3 reps (~0.5 m/s) 3 mins rest	<b>a, b, d</b>	Trap bar deadlift, ½ squat (no pins), leg press, heavy trap bar/squat jumps, towel isometric mid-thigh pull
B1. Medicine ball punch throw (relatively heavy MB)	3 sets x 4 reps each side	<b>c</b>	Bench throw, ballistic bench, push press variations
B2. Seated rotational medicine ball throws with partner return (focus on catch on return)	3 sets x 5 reps each side 1-2 mins rest	<b>b, d</b>	GHD supine hold with rotation, BB standing Russian twist, DB seated Russian twists, eccentric pallof press
C. Pendlay row	2 sets x 3-5 reps (~0.6 m/s)	<b>b, c, d</b>	DB row, seated cable row, band rows, pull-ups, lat pull-downs
<i>Note: RPE=rate of perceived exertion; IMTP=isometric mid-thigh pull; DB=dumbbell; MB=medicine ball; m/s=metres per second; GHD=glute ham developer; RDL's=Romanian deadlifts; BB=barbell.</i>			

**Table 2:** An example programme for this DP World Tour player, including notes related to outcomes, as well as suggested alternative exercises for limited facilities during travel.

**TABLE 3**

<i>Session Type</i>	<i>Session Prescription</i>
<i>Speed based, movement-focused session</i>	<i>Build up to 3 maximum effort drives (maximum intent). Take the average clubhead speed. Over a 20 minute period, attempt to find an increase of at least 4 mph through exploring movement strategies.</i>
<i>Speed based, skill-focused session (on the range)</i>	<i>Identify 2 fairway widths (one challenging, one average difficulty). Hit 6 sets of 1 standard shot (stock), 1 low flight shot (bullet) and 1 maximum distance shot (bomb). Set a minimum ball speed for the bomb to 'count'. Score the game as follows: Stock and bullet shots = +2 points for challenging fairway, +1 point for average fairway, -1 point for missed fairway. Bomb shot = +3 points for challenging fairway, +2 points for average fairway, -1 point for missed fairway. Record final score /42.</i>
<i>Speed based, skill-focused session (on the course)</i>	<i>Play 18 holes. Hit both a bomb and stock shot for all appropriate holes. Continue the hole using the best ball. Record how many 'best balls' were bomb vs. stock shots.</i>
<i>Speed based, competition-focused session</i>	<i>During a practice round, identify key holes where a longer drive may yield a tactical advantage. Explore the use of a bomb shot on those holes during the practice round.</i>

*Note: Levels of representativeness are lowest at the top of the table and highest at the bottom.*

**Table 3:** Example speed training sessions at varying levels of representativeness.

for the accustomed golfer, making it easier for them to train before or after a tee time, depending on their schedule. These are some approaches we can use to mitigate risk of negative outcomes from training on performance during the tournament.

**A learning-based approach to speed training**

For a player to increase their distance in tournament play, they need to be exposed to opportunities for learning, so that they can utilise their newfound physical capacities effectively. This learning process should be underpinned by a clear understanding of the outcome from any particular session over time (e.g., clubhead speed, ball speed, ball speed with tight dispersions, etc.). In addition, these outcomes are likely to have a concurrent focus, with initial learning taking place in a more sterile (movement-focused) environment, allowing a player to explore the development of speed. This should subsequently build to a more tournament appropriate application of speed (which is more representative of the game of golf), ready for use in competition. Table 3 shows example sessions along this continuum. However, the player, golf coach and physical preparation coach should design their own sessions, appropriate to the learning needs of the player.

**Perceived wellbeing and readiness approach to recovery and stress/load management**

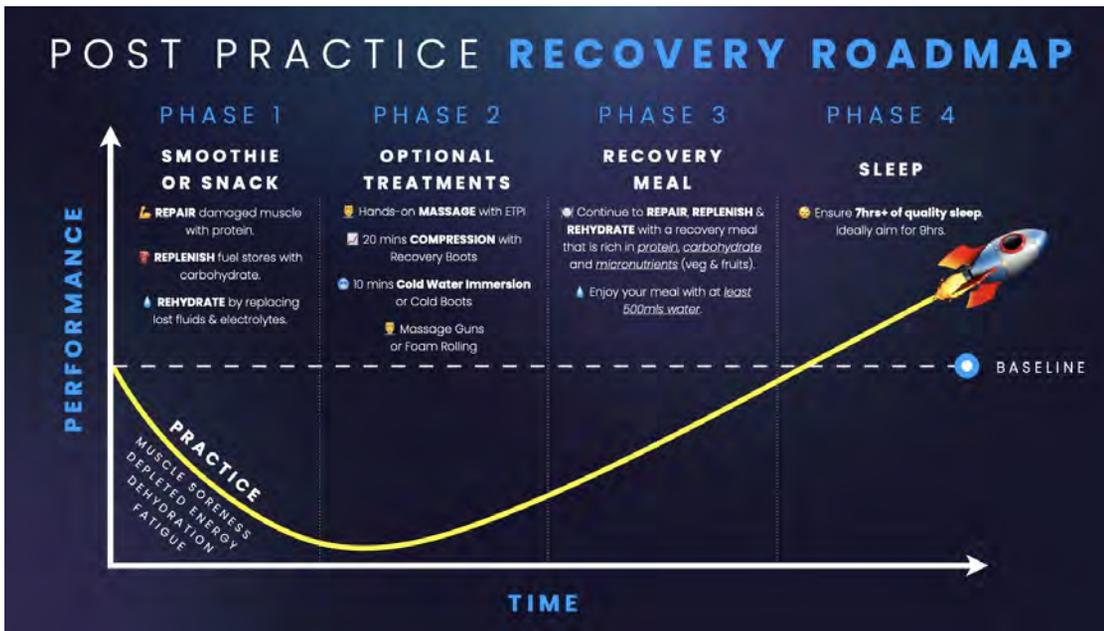
Recovery modalities and appropriate stress/load management strategies should primarily be approached from the perspective of enhancing perceived wellbeing and readiness. Golf is highly 'feel based' and different players will have preferred physical and mental states to optimise their readiness and sense of wellbeing. It is therefore important for the team to work alongside the player to explore appropriate approaches to managing their day-to-day stresses. This may take the form of tailoring physical training or practice schedules to suit the player, optimising travel and volume of tournament play, working alongside sports psychologists to explore relevant psychological strategies, encouraging appropriate delegation of tasks, and ensuring adequate sleep opportunities. While some modalities may have a higher degree of physiological rationale, the primary outcome should still focus on perceptions of wellbeing and readiness. One player may feel as though cold-water immersion post round is helpful, whereas others may prefer massage, stretching, light exercise, pool work or just resting in the hotel. Finding what works for an individual player and recognising time constraints

is critical, rather than focusing on a single preferred approach that coaches may have seen work in other players.

The athlete can benefit from education and support in this regard, recognising the importance of other aspects of recovery such as nutrition, hydration, sleep, social interaction, reading, peaceful time, etc. Moreover, they should ensure the player is adaptable to their recovery approach and has information they can access to guide them. Figure 4 below is an example of information shared at a 2023 team event.

**CONCLUSION**

In conclusion, physical preparation is an increasingly important part of an elite and professional golfer's routine, which likely supports injury risk reduction, improved performance, enhanced longevity and health. Despite the numerous lifestyle constraints of a touring professional golfer, it is entirely possible for them to make continued progress in their physical condition throughout the year, using some simple strategies and with support from a coach. In addition, these same benefits could potentially be seen by the 66 million recreational golfers globally if they could incorporate appropriate physical preparation strategies into their routines.



**Figure 4:** Example of information on recovery highlighting non gym-based strategies (created by David Dunne for a 2023 team golf event).

#### References

1. Brodie, M. (2014). *Every shot counts: using the revolutionary strokes gained approach to improve your golf performance and strategy*. New York Gotham Books.
  2. Ehlert, A. (2020). *The effects of strength and conditioning interventions on golf performance: A systematic review*. *Journal of Sports Sciences*, 38, 2720–2731.
  3. Brearley, S, Coughlan, D, and Wells, J. (2019). *Strength and conditioning in golf: Probability of performance impact*. *Sport Performance and Scientific Reports*, 1, 1–3.
  4. Murray AD, Daines L, Archibald D, Hawkes RA, Schiphorst C, Kelly P, Grant L and Mutrie N. (2017). *The relationships between golf and health: A scoping review*. *British Journal of Sports Medicine*, 51(1), 12–19.
  5. Bishop C, Ehlert A, Wells J, Brearley S, Brennan A, and Coughlan D. *Strength and conditioning for golf athletes: Biomechanics, common injuries and physical requirements*. *Professional Strength and Conditioning Journal*, 63, 7–18.
  6. West, S, Fern, J, Canter, L, Murray, A. *Beyond physical load in golf – the tip of the load iceberg*. Available from: <https://blogs.bmj.com/bjbm/2020/09/25/beyond-physical-load-in-golf-the-tip-of-the-load-iceberg/> [Accessed 17 April 2023].
  7. Ehlert A and Wilson P. (2019). *A Systematic Review of Golf Warm-ups: Behaviors, Injury, and Performance*. *Journal of Strength and Conditioning Research*, 33, 3444–3462.
  8. Fradkin AJ, Sherman CA and Finch CF. (2004). *Improving golf performance with a warm up conditioning programme*. *British Journal of Sports Medicine*, 38, 762–765.
- Daniel Coughlan P.T., Ph.D. <sup>1,2,3,4,6</sup>
- Nigel Tilley P.T. <sup>1</sup>
- Luke Mackey <sup>5</sup>
- Fiona Scott <sup>2,4</sup>
- Simon Brearley <sup>1,2</sup>
- Chris Bishop Ph.D. <sup>1,3,4,6</sup>
1. European Tour Health and Performance Institute, European Tour Group, Virginia Water, UK.
  2. England Golf, Woodhall Spa, Lincolnshire, UK.
  3. Medical and Scientific Department, The R&A, St Andrews, UK
  4. Health and Performance Institute, Ladies European Tour, Denham, UK
  5. Performance Department, Golf Australia, Melbourne, Australia
  6. London Sport Institute, Middlesex University, London, UK
- Contact: c. bishop@mdx.ac.uk